

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicants: HERZHAFT et al

Serial No.: 10/797,004

Filed: March 11, 2004

For: Method And Device For Analyzing The CO<sub>2</sub>  
Contained In A Drilling Fluid

Art Unit: 1795

Examiner: Akram, I.

Conf. No.: 3890

**APPEAL BRIEF**

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Commissioner For Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

June 13, 2008

Sir:

This Appeal Brief is being submitted under 37 CFR 41.37 in connection with the appeal of the above-identified application, a Notice of Appeal having been filed on April 15, 2008.

**REAL PARTY IN INTEREST**

The real party in interest is Institut Francais Du Petrole of Rueil Malmaison Cedex, France, the assignee of the subject application.

## RELATED APPEALS AND INTERFERENCES

On information and belief, there is no other prior or pending appeal, interference or judicial proceeding known to Appellants, Appellants' legal representative, or assignee which may be related to, directly affect, or be directly affected by or have a bearing on the Board's decision in this pending appeal.

## STATUS OF CLAIMS

Claims 1-12 are pending in the application. All of the claims, i.e., claims 1-12 stand finally rejected and are being appealed.

## STATUS OF AMENDMENTS

No amendment has been filed subsequent to final rejection. A Request for Reconsideration After Final Rejection was filed March 17, 2008 and has been considered by the Examiner. See, the Advisory Action mailed April 3, 2008.

## SUMMARY OF CLAIMED SUBJECT MATTER

### Independent Claim 1

Claim 1 is directed to a method for estimating the quantity of CO<sub>2</sub> present in a geologic formation. See, e.g., page 2, lines 18 and 19 of Appellants' specification. The method includes the following steps. Referring by way of example only to Figure 4, a geologic formation 20 is penetrated by a well 10 drilled from the surface. See, page 2, line 20 and page 8, lines 22-24 of Appellants' specification. The formation 20 is

contacted with a drilling fluid 21 having a pH greater than 8. See, e.g., page 2, line 21, page 4, lines 26 and 27 and page 8, lines 23-24 of Appellants' specification. The drilling fluid 21 travels from the formation 20 to the surface, as shown by the arrows in borehole 18 in Figure 4. See, page 2, lines 21-22 and page 8, lines 23-24 of Appellants' specification.

A given quantity of return fluid (drilling fluid that has traveled from the formation to the surface) is sampled at the surface and transferred to a cell 5. See, page 2, lines 23-24 and page 8, lines 1-3 of Appellants' specification. The pH of the quantity of fluid is measured. See, page 2, line 25 and page 8, lines 5-6 of Appellants' specification. A given quantity of product acidifying the fluid is added to adjust the pH to a value of less than 4. See, page 2, lines 26-27 and page 8, lines 10-12 of Appellants' specification.

The CO<sub>2</sub> level of the gas in the cell 5 is measured after the acidification step. See, e.g., page 2, lines 28-29 and page 8, lines 6-10 of Appellants' specification. The quantity of CO<sub>2</sub> contained in the geologic formation 20 is calculated from the CO<sub>2</sub> measurement. See, e.g., page 3, lines 1-2 and page 9, line 1 to page 10, line 2 of Appellants' specification.

#### Independent Claim 7

Independent claim 7 is directed to a device for estimating the quantity of CO<sub>2</sub> present in a geologic formation. As shown by way of example only in Figure 4, the device estimates the quantity of CO<sub>2</sub> present in a geologic formation 20 traversed by a well 10 in which a drilling fluid 21 with a pH greater than 8 travels between the formation 20 and the wellhead at the surface. See, e.g., page 3, lines 13-15 and page 8, lines 22-

24 of Appellants' specification.

The device includes "means for sampling a given quantity of fluid at the wellhead." This "means-plus-function" limitation finds an example of corresponding structure in Figure 4 and described at page 8, lines 1-3 of Appellants' specification. The structure is generally identified with the reference numeral 6 and can include a pipe 7 and distribution means 8, for example a pump and/or valves.

The device also includes a cell 5 to hold the quantity of fluid. See, e.g., page 3, line 17 and page 8, lines 1-3 of Appellants' specification.

The device also includes "means for inert gas scavenging of the internal space of the cell." This "means plus function" limitation finds an example of corresponding structure in Figure 4. For example, the scavenging means comprises a pipe 13 for introducing an inert gas into the cell 5 and pipe 14 for evacuating the gas contained in the top of the cell. See, e.g., page 8, lines 6-9 of Appellants' specification, as well as page 3, lines 18-19 of Appellants' specification.

The device also includes "means for injecting and acidifying product into said cell." This means plus function limitation finds an example of corresponding structure in Figure 4. For example, an acid pump 16 can enable a strong acid to be injected into the cell. See, e.g., page 8, lines 10-12 of Appellants' specification, as well as page 3, line 19 of Appellants' specification.

The device also includes "means for measuring CO<sub>2</sub> contained in the internal space of the cell." This means plus function limitation finds an example of corresponding structure in Figure 4. For example, a CO<sub>2</sub> analyzer 15 can be provided,

e.g., as an infrared sensor or another known measuring device. See, e.g., page 8, lines 9 and 10 of Appellants' specification as well as page 3, lines 19-20 of Appellants' specification.

### GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-3 and 6 stand rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over U.S. Patent No. 4,904,603 to Jones et al. in view of U.S. Patent 4,299,794 to Kelley et al.

Claim 4 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. and Kelley et al. and further in view of U.S. Patent No. 4,397,957 to Allison.

Claim 5 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. and Kelley et al. and further in view of U.S. Patent No. 4,994,117 to Fehder.

Claims 7-12 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. and Kelley et al. and further in view of Allison.

### ARGUMENTS

#### Claims 1-3 Are Patentable Over Jones et al. in view of Kelley et al.

The patent to Jones et al. discloses a method of testing drilling mud which comprises periodically sampling the circulating mud and analyzing its aqueous filtrate at the rig site by ion chromatography for selected positive and negative ions. One or more other parameters of the sampled mud and/or mud filtrate, e.g., pH and temperature, may also be measured. As admitted by the Examiner, the Jones et al. patent does not

disclose acidifying a quantity of sampled fluid and measuring the carbon dioxide level of a gas in a cell after the acidification step.

Significantly, the Jones et al. patent also does not disclose the step of calculating the quantity of CO<sub>2</sub> contained in the geologic formation from the CO<sub>2</sub> measurement.

See, claim 1, last two lines. In fact, it appears one of the preferred purposes of the monitoring method disclosed in Jones et al. is to indicate downhole interactions so that the composition of the mud supplied to the hole can be adjusted to or towards the optimum as drilling proceeds. See, column 3, lines 52-57 of Jones et al. Nowhere is it disclosed or suggested that the quantity of CO<sub>2</sub> contained in the geologic formation can be calculated from CO<sub>2</sub> measured in return fluid according to the presently claim method.

The Kelly et al. patent discloses a total carbon dioxide analyzer system that has a reaction chamber that includes a tube and a piston mounted for sliding movement in the tube to change the volume of the chamber. In operation, a sample to be analyzed and an acid reactant (that interacts with the sample to produce carbon dioxide) are flowed into the chamber by increasing the chamber volume, and a controller then seals the chamber by closing a valve. Carbon dioxide is then generated, the volume of the sealed chamber is increased, and the mixture is stirred to enhance the release of dissolved carbon dioxide into the gaseous phase. Then the quantity of carbon dioxide in the chamber is measured. It is disclosed that acid reagents such as lactic acid can be used to cause the final reaction mixture to have a pH of less than 3.0.

Nothing in Kelly et al would have provided any reason to calculate the quantity of CO<sub>2</sub> contained in a geologic formation from CO<sub>2</sub> measured in a return drilling fluid.

Accordingly, even the proposed combination of Jones et al. and Kelly et al. would not have rendered obvious the method, including the step of calculating the quantity of CO<sub>2</sub> contained in the geologic formation from the CO<sub>2</sub> measurement in the return fluid, according to claimed method.

Moreover, while the Kelley et al. patent discloses that the invention is useful in measuring carbon dioxide content of many different fluids, including industrial waste, and industrial process fluids, in a particular embodiment, total carbon dioxide in serum and plasma is determined in a system that utilizes a sample volume of less than 50 microliters.

Appellants submit there would have been no apparent reason to combine the teachings of the Jones et al. and Kelley et al. patents in that the combined teachings would not have rendered obvious in the presently claimed invention. In particular, nothing in the Jones et al. patent or the Kelley patent provides any apparent reason why one of ordinary skill in the art would have provided an additional monitoring function of the drilling mud in Jones et al. to monitor the carbon dioxide level. Moreover, noting the Kelley et al. patent, in a particular embodiment, is directed to measuring the total carbon dioxide in serum and plasma, it submitted there would have been no apparent reason why one of ordinary skill in the art would have looked to the teachings of Kelley et al. to modify the teachings of Jones et al. In addition, noting that the Kelley et al. patent is particularly directed to using a sample volume of less than 50 microliters, it is submitted there is no apparent reason why one of ordinary skill in the art would have employed the sampling method of Kelley et al. in the monitoring system of Jones et al.

For the foregoing reasons, the presently claimed invention is patentable over the

proposed combination of Jones et al. and Kelley et al.

Claim 4 Is Patentable over Jones et al. and Kelley et al. and Further in view of Allison

The deficiencies of the proposed combination of Jones et al. and Kelley et al are noted above.

Claim 4 is patentable over Jones et al. and Kelley et al. at least for the reasons noted above.

The Allison patent discloses a method for determining the concentration of carbonate salts in solutions containing other inorganic salts. The method includes converting the carbonate salts to carbon dioxide by acidifying the sample, sweeping the acidified solution with an inert gas to strip the carbon dioxide from the solution and contacting an ion-selective gas-sensing electrode with the gas stream. The electrode includes a buffered solution which changes in pH depending on the concentration of carbon dioxide in the gas stream thereby providing a measure of the carbonate salt concentration in the sample. The intent of Allison is to measure the carbonate salt concentration in the sample, not the quantity of CO<sub>2</sub> contained in a geologic formation. Thus, Allison does not remedy any of the basic deficiencies of Jones et al and Kelley et al noted above. The teaching of sweeping the acidified solution with an inert gas to strip carbon dioxide converted from the carbonate salts from the solution in no way provides a reason to sweep any gas in the process of Jones et al or Kelley et al. It is not clear why one of ordinary skill in the art would have a reason to sweep a gas in either of these processes. Accordingly, claim 4 is patentable over the proposed combination of references for this additional reason.



Claim 5 Is Patentable over Jones et al. and Kelley et al. and Further in view of Fehder

The deficiencies of the proposed combination of Jones et al. and Kelley et al. are noted above.

The Examiner has cited the Fehder patent for the following teaching:

Each of the components in the detector is calibrated by selecting one or more of three parameters of the indicating element, namely:

1. the nature of the base;
2. the concentration of the base in the solution used to impregnate the carrier. This parameter provides the initial pH of the solution in equilibrium or steady state with the baseline concentration of carbon dioxide; and
3. the pK of the chromogenic pH-sensitive indicator.

However, clearly nothing in Fehder remedies any of the basic deficiencies of Jones et al and Kelley et al noted above. Accordingly, claim 5 is patentable over the proposed combination of references at least for the reasons noted above.

Claims 7-12 Are Patentable over Jones et al. and Kelley et al. and Further in view of Allison

Claims 7-12 are directed to the device of the present invention for estimating the quantity of CO<sub>2</sub> present in a geologic formation traversed by a well in which a drilling fluid with a pH greater than 8 travels between said formation and the wellhead at the surface, characterized in that it comprises means for sampling a given quantity of fluid at the wellhead, a cell to hold said quantity of fluid, means for measuring the pH in said cell, means for inert-gas scavenging of the internal space of the cell, means for injecting an acidifying product into said cell, and means for measuring the quantity of CO<sub>2</sub> contained in the internal space of the cell.

As admitted by the Examiner, the Jones et al. patent does not disclose means for

acidifying a quantity of sampled fluid and means for measuring the carbon dioxide level of a gas in a cell after the acidification step.

While the Kelley et al. patent discloses that the invention is useful in measuring carbon dioxide content of many different fluids, including industrial waste, and industrial process fluids, in a particular embodiment, total carbon dioxide in serum and plasma is determined in a system that utilizes a sample volume of less than 50 microliters.

There would have been no apparent reason to combine the teachings of the Jones et al. and Kelley et al. patents in that the combined teachings would not have rendered obvious in the presently claimed invention. In particular, nothing in the Jones et al. patent or the Kelley patent provides any apparent reason why one of ordinary skill in the art would have provided an additional monitoring means for monitoring of the drilling mud in Jones et al., i.e., means for measuring the carbon dioxide level. Moreover, noting the Kelley et al. patent, in a particular embodiment, is directed to measuring the total carbon dioxide in serum and plasma, it submitted there would have been no apparent reason why one of ordinary skill in the art would have looked to the teachings of Kelley et al. to modify the teachings of Jones et al. In addition, noting that the Kelley et al. patent is particularly directed to using a sample volume of less than 50 microliters, it is submitted there is no apparent reason why one of ordinary skill in the art would have employed the sampling means of Kelley et al. in the monitoring system of Jones et al.

The Allison patent discloses a method for determining the concentration of carbonate salts in solutions containing other inorganic salts. The method includes converting the carbonate salts to carbon dioxide by acidifying the sample, sweeping the

acidified solution with an inert gas to strip the carbon dioxide from the solution and contacting an ion-selective gas-sensing electrode with the gas stream. The electrode includes a buffered solution which changes in pH depending on the concentration of carbon dioxide in the gas stream thereby providing a measure of the carbonate salt concentration in the sample. The intent of Allison is to measure the carbonate salt concentration in the sample, not the quantity of CO<sub>2</sub> contained in a geologic formation. Thus, Allison does not remedy any of the basic deficiencies of Jones et al and Kelley et al noted above. The teaching of sweeping the acidified solution with an inert gas to strip carbon dioxide converted from the carbonate salts from the solution in no way provides a reason to sweep any gas in the system of Jones et al or Kelley et al. It is not clear why one of ordinary skill in the art would have a reason to sweep a gas in either of these processes. Accordingly, claims 7-12 are patentable over the proposed combination of references for this additional reason.

CONCLUSION

For the foregoing reasons, the final rejections of claims 1-12 should be reversed.

Respectfully submitted,

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## CLAIMS APPENDIX

1. Method for estimating the quantity of CO<sub>2</sub> present in a geologic formation comprising the following steps:

- said formation is penetrated by a well drilled from the surface,
- said formation is contacted with a drilling fluid having a pH greater than 8 that travels from the formation to the surface,
- a given quantity of return fluid is sampled at the surface and transferred to a cell,
- the pH of said quantity of fluid is measured,
- a given quantity of product acidifying said fluid is added to adjust the pH to a value of less than 4,
- the CO<sub>2</sub> level of the gas in the cell is measured after the acidification step,
- the quantity of CO<sub>2</sub> contained in the geologic formation is calculated from the CO<sub>2</sub> measurement.

2. Method according to Claim 1, wherein the quantity of carbonate supplied by the geologic formation and/or by the additives in the formulation of said fluid is taken into account.

3. Method according to Claim 1, wherein the pH is adjusted to approximately 2.

4. Method according to Claim 1, wherein said gas is transferred from the cell to an analyzer in which the CO<sub>2</sub> level of the gas is measured by an inert gas scavenging

the internal space of the cell.

5. Method according to Claim 2, wherein said additives are taken into account by running the CO<sub>2</sub> measurement method on a given volume of initial fluid before contact with the formation.

6. Method according to Claim 1, wherein the sampling rate is determined according to the fluid travel rate.

7. Device for estimating the quantity of CO<sub>2</sub> present in a geologic formation traversed by a well in which a drilling fluid with a pH greater than 8 travels between said formation and the wellhead at the surface, characterized in that it comprises means for sampling a given quantity of fluid at the wellhead, a cell to hold said quantity of fluid, means for measuring the pH in said cell, means for inert-gas scavenging of the internal space of the cell, means for injecting an acidifying product into said cell, and means for measuring the quantity of CO<sub>2</sub> contained in the internal space of the cell.

8. Device according to Claim 7, wherein adjusting means control the acid injection means according to the pH measurement.

9. Device according to Claim 7, wherein the means for measuring the quantity of CO<sub>2</sub> comprise an infrared cell or a thermal conductivity measuring cell.

10. Device according to Claim 7, wherein control means carry out the following steps, at a rate determined by the fluid flowrate:

- Sampling of a quantity of fluid;
- Measurement of pH;
- Injection of a quantity of acid;
- Scavenging the cell space;
- Measurement of CO<sub>2</sub>;
- Emptying the cell.

11. Device according to Claim 7, including means for measuring the internal pressure of said cell.

12. Device according to Claim 7, including means for regulating the temperature of said cell.

## EVIDENCE APPENDIX

NONE



RELATED PROCEEDINGS APPENDIX

NONE